

TO THE CONGRESS OF THE UNITED STATES.

BRIDGING

THE

OHIO & MISSISSIPPI RIVERS.

MEMORIAL

OF

CINCINNATI CHAMBER OF COMMERCE.

*Testimony of Pilots, Underwriters, Coal Dealers, and others
interested in Navigation.*

*Letters of John A. Roebling, James B. Eads, W. Milnor
Roberts, and others.*

CINCINNATI:

GAZETTE STEAM PRINTING ESTABLISHMENT, COR. FOURTH AND VINE STS.

1868.

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MEMORIAL.

To the Congress of the United States :

The undersigned, a committee appointed by the Cincinnati Chamber of Commerce to memorialize Congress in favor of a general law to regulate the construction of bridges over the Ohio and Mississippi Rivers, so that they shall not obstruct nor make dangerous the navigation thereof, ask leave to say :

That the citizens whom we represent are interested both in the preservation and improvement of the navigation of these rivers, and in the extension and perfection of the railroad system ; and that, recognizing that the bridging of these rivers is requisite to the completeness of the railroad lines, they are in favor of their construction wherever business demands them, subject to such regulations as will prevent their being made an impediment to navigation.

They believe that it is feasible to accommodate and protect the great interests both of navigation and railroads, and, therefore, they maintain that there is no necessary antagonism between these interests.

That these rivers, forming, with their tributaries, natural channels of transportation for half the continent, whose conditions are admirably adapted to the most economical carrying of the products of the soil, the mines, and the forest are entitled to the jealous care of the Nation ; and it will be a disastrous and irreparable error, if, through the Nation's negligence, these natural channels are permitted to be obstructed by artificial works which can never supply their places.

That the cheapness of transportation on these rivers of the heavy and bulky products of the mines, the forest, and the soil, which furnish the materials for manufactures, and the facilities which this navigation furnishes for distributing the manufactured products, draws, and will always continue to draw, to their

banks, the great manufacturing business of the country. This will make the railroads feeders to the rivers, as well as channels of distribution from them; and thus, instead of the trade of the rivers being doomed to decay by the introduction and extension of railroads, each will contribute to the progress and success of the other. And, therefore, it is reasonable to conclude that the future growth of the business of navigation, in its varied forms, will be as certain and great as that of the railroads. It would be a blind policy which regarded the interests of navigation and of railroads as opposed; or which concluded that both are not needed for the future growth and full development of this country, and, therefore, that one may be thrown away, or needlessly embarrassed and hindered. It will hardly be denied that the interests of the producer from the soil and mines, the manufacturer, and those engaged in commerce, demands the cheapest mode of transportation, and that this is to be found on the navigable rivers. That in order to preserve the navigation and cheap transportation, the channels of the rivers must be kept safe and practicable for such craft and such modes of running as are in use, and are adapted to the most economical carrying; and that the passage must not only be possible, but must not be hazardous. The negligence, or the mistaken policy, which permits the obstruction of this navigation by slow and gradual approaches, by the placing of partial impediments here and there, which create hazards, place limitations on the kind of water craft used, or on their running, and increase the expense of navigation, will as certainly be fatal in the end, as if a complete bar were authorized.

Your memorialists have to state that bridges have been authorized and built upon the Ohio and Mississippi rivers, which have materially increased the hazards and expense of navigation; and that bills are now pending before your Honorable Body to authorize the construction of other bridges over the Ohio River, which, if constructed, your memorialists believe, will constitute such an obstruction to navigation, and will so increase its expenses and hazards, that they will accomplish a long step toward the ruin and abandonment of this navigation. They have to state — and for the support of this they refer to the testimony appended hereto, of the great body of the Ohio River pilots — that a bridge span of but three hundred feet, in the rapid current

of the Ohio River, will make the passage at a high stage of water hazardous; will generally cause detention in the night, and during high winds; and will be impracticable, except at extreme risk, for the towed barges which are used for the great transportation on these rivers. The increase to the hazards and to the cost of navigation, by the construction of such bridges, which will be multiplied if these are allowed, will be so great that only an overpowering necessity, which has brought the issue that the river navigation must be sacrificed to greater interests, can justify their permission.

Your memorialists deny that public necessity has come to such an issue; or that the destruction or material obstruction of the river navigation, is necessary to allow all needed facilities to the crossing of the river by railroads. We have to state, upon high engineering authority, and upon the evidence of practical proof, that the construction of bridges with channel spans of not less than five hundred feet is practicable, without an inordinate increase in their cost; and that this length of passage between piers, in a rapid river, with such water craft as are used on these rivers, is as narrow as they should be subjected to. Your memorialists deny that engineering science has reached its ultimatum in a bridge span of three hundred feet; or that the negative experience, or the backwardness of former ages should now be brought up to give progress in engineering a turn backward, for the purpose of fixing three hundred feet span as the limit of human endeavor in bridge building. They also protest that private interests, in the considerations of comparatively small differences in the cost of bridges, should not be permitted to sacrifice, or imperil this great national interest.

Your memorialists, therefore, respectfully state, that a channel of five hundred feet between piers is the least that is compatible with reasonable safety to navigation; that bridges, safe, for any use whatever, can be built with such spans without great increase of cost; therefore they represent that these are the proper terms for the union of the interests of the railroads and of the navigable rivers. They further represent that draw-bridges have been found by experience to be so great an obstruction to navigation, and so imperfect a communication for land travel, that it is believed the construction of any more of them would now be easily abandoned by general consent.

Your memorialists, therefore, pray for the enactment of a general law to authorize and regulate the building of bridges over the Ohio and Mississippi rivers, by which they may be constructed wherever needed, upon conditions that they shall have at least one channel span, at a right angle with the channel current, of not less than five hundred feet; and of not less than fifty feet in the clear, above high water mark.

Your memorialists further refer to the appended testimony as to the necessity for these terms in order to protect this navigation, and as to the feasibility of building bridges subject to these conditions.

R. BUCHANAN,
 ROBERT MITCHELL,
 MATTHEW ADDY,
 S. LESTER TAYLOR,
 WM. RESOR,
 D. T. WOODROW,
 R. M. BISHOP,
 GEO. F. DAVIS,
 OLIVER PERIN,
 SAM. J. HALE,
 R. B. SMITH,
 WM. HOOPER,
 MILES GREENWOOD,
 H. C. LORD,
 THEO. COOK,

Committee.

RESOLUTIONS

Of the Cincinnati Chamber of Commerce, in the matter of Bridging the Western Rivers.

As an expression of the sense of the CINCINNATI CHAMBER OF COMMERCE, in regular meeting assembled, April 13, 1868, touching the bridging of the Ohio river, be it

Resolved, That the importance of the navigation of the Ohio river to the commerce and manufactures of Cincinnati, and to the Western States, demands that the bridging of the rivers for other highways shall be subject to such regulations as shall prevent them from obstructing navigation, or making it unsafe.

Resolved, That experience and the progress of engineering science have demonstrated that safe and permanent bridges, of a height and length of span that will reduce the obstruction to navigation to the minimum, can be built, without requiring of them any impracticable conditions, or subjecting them to any inordinate cost; and thus the great public interests of navigation and of railroads may all be preserved and accommodated.

Resolved, That every bridge over the Ohio river should be required to have at least one span of not less than five hundred feet over the main channel; and that piers which shall narrow the navigation more than this, will be a serious and unjustifiable obstruction and danger. We therefore ask the General Assembly of Ohio and the Congress of the United States, to provide that all bridges over this river shall be required to have at least one span of not less than five hundred feet over the main channel.

Resolved, That the legislation of Congress in making appropriations for the removal, both of natural and artificial obstructions in the navigable rivers of the West, is wise and judicious; and we respectfully urge that, while large sums are being annually expended for these purposes, neither Congress nor any State Legislature shall authorize or permit the creation of obstructions to these navigable waters, by bridges, of a character which experience has proved to be more dangerous and difficult to be overcome than the snags and bars which are being removed.

Resolved, That we hold it to be the power and duty of Congress to be the guardian of the interests of the people of all the States in the great navigable rivers; and we respectfully ask that body to enact general regulations for the construction of bridges over the Ohio and Mississippi rivers, so that they shall

have at least one span of not less than five hundred feet over the main channel, and a hight sufficient to permit the safe passage of boats at all stages of the water.

The above is a true copy of resolutions, which were unanimously adopted, at a regular meeting at the Cincinnati Chamber of Commerce, April 14th, 1868.

JOHN A. GANO, *President.*

GEO. A. McLAUGHLIN, *Secretary.*

PETITION.

To the Congress of the United States:

The undersigned coal dealers of Cincinnati, beg respectfully to represent to your Honorable Body, that bridges built over the Ohio river, placed upon piers three hundred feet apart, will be a cause of great damage to the coal interest of the West, as is already proved by the bridge at Steubenville, where heavy losses in coal as well as other property annually occur. Aside from the actual losses of property occurring at this obstruction at Steubenville, there is a heavy loss sustained by those who are engaged in the coal towing business, by reason of the detention of boats and barges, in the night time, and during high winds when it is positively unsafe to attempt the passage of these bridge piers. In order to pass tows safely through these piers, it is often necessary to employ an additional steamer, which involves considerable cost in money, as well as much loss of time. The cost of running a fully equipped and manned tow boat, is from \$200 to \$300 per day. This cost does not include the interest on money invested in the boat and barges, varying from \$30,000 to \$75,000 for each boat with her complement of barges, nor for depreciations, wear and tear and insurance on this property. Therefore, we represent, that this detention in passing bridge piers, involves a heavy outlay to the owners of coal tow boats and barges, and must necessarily be added to the cost of the coal at its point of destination. We further represent that experience proves, that by increasing the size of the boats and barges, and the number towed by each boat, that the cost of transporting the coal is lessened, and that for this reason the size of tows is constantly being increased, so that now a boat tows twice the quantity of coal that she would have transported ten years ago.

Many of the tows of the largest coal tugs now in use, have a

width on the surface of the water of 192 feet, and a length of 450 feet, and contain 16 barges of say 11,500 bushels each, or 184,000 bushels, making 7,360 tons in the aggregate. It will be clear to the mind of every person familiar with the navigation of the Ohio river, with its strong current in high water, that it is very difficult and dangerous for such tows to pass bridge piers only three hundred feet apart. It must also be remembered that the towing business is mainly done at the seasons of the year when the river is at what is called a high stage: and that there is a constant tendency to increase the power and capacity of the boats and barges used, and the quantity of coal contained in a single tow.

Many millions of capital are now invested in the coal mines, tow boats and barges on the Ohio river, and it is believed that the consumption of coal is doubling, and will continue to double every ten years. The certainty of obtaining constant supplies of cheap fuel, is inducing large investments in the various branches of manufacturing in the cities and towns along the Ohio and Mississippi rivers; and we ask that Congress shall not permit bridges to be built over these rivers of such a character as to impede and render dangerous these natural channels, now so extensively used for transportation.

The fact is undeniable, and is well known to all coal dealers, and to manufacturers that the Steubenville bridge imposes a tax upon every bushel of coal which passes its piers, and that this tax is in the end paid by the consumer. If the number of bridges is multiplied, the tax will be increased in proportion.

Your petitioners further state, that they have no desire to prevent the connection of railroads terminating on opposite sides of the river, but that they cheerfully grant the right of bridging the river, for this or any other purpose, provided that it be done in such manner as to leave navigation reasonably safe; and that this navigation will not be safe where the bridge piers are less than five hundred feet apart over the channel, or where the bridge has a less height than fifty feet above high-water mark.

Your petitioners, therefore, believing that it is both the right and duty of Congress to exercise supreme control in this matter, pray for the passage of a general law, by which bridges may be built over the Ohio and Mississippi rivers, wherever needed, with

at least one span over the main channel of not less than five hundred feet between the main piers, and not less than fifty feet high at high-water mark.

And your petitioners will ever pray, etc.

THOS. DODSWORTH.
R. B. SMITH & CO.
P. MOULTON.
JOHN COCHNOWER.
MARMET & CO.
ROSS, PETTIBONE & CO.
W. Q. ADAMS & CO.
FOOTE & DONALDSON.
A. BUCHANAN.

JAMES C. BLICK.
G. W. C. JOHNSTON.
WM. F. IRWIN.
L. H. SARGENT & CO.
M. T. DELORAC.
WM. W. STONE & CO.
LEVY & FRANK.
JOSEPH SMITH, JR.
WM. M. HUBBELL,

OPINION OF WESTERN RIVER PILOTS.

CINCINNATI, May 6th, 1868.

We, the undersigned, licensed pilots on the Ohio river, hereby declare that it would be difficult and dangerous for us to navigate large and heavily laden Steamboats, and boats with tows of barges, between the piers of a bridge having a span of only three hundred feet between the piers over the channel, even though the bridge was built at right angles to the current, and the piers in a line with the current.

While this danger and obstruction at a low stage of the river would be comparatively small, it would be increased with the rise of water in the river, until at a stage of twenty feet and upwards, when the heavy business, especially in towing, is done, it would be very serious. We regard it as clear to the mind of any sensible river man and navigator, that the placing of five or six piers within the banks of our narrow river, will, by dividing the water at the piers, create "cross currents" and "eddies" dangerous to navigation. The water above the piers will be higher than below, and the force of the current materially increased, varying of course with the stage of water. To be reasonably safe, the length of span should be five hundred feet.

David Blashford.....	A Pilot 40 years.	Alsabid Jolly.....	A Pilot 22 years.
James C. Johnston...	" 43 "	John Morbridge.....	" 16 "
H. S. Williams.....	" 33 "	H. B. Robinson.....	" 12 "
Solomon Catterlin...	" 31 "	James Nichlos.....	" 8 "
Wm. H. Early.....	" 20 "	Thomas Bobo.....	" 8 "
Brison Pursell.....	" 25 "	Charles E. Keating..	" 5 "
John Gray.....	" 25 "	John Jolly.....	" 38 "
Oscar B. Jolly.....	" 12 "	G. W. Burks.....	" 27 "
C. B. Brasher.....	" 37 "	John R. Sullivan...	" 14 "
John T. Carroll.....	" 20 "	James Prater.....	" 20 "
Thos. Varner.....	" 39 "	B. F. Ogle.....	" 20 "
S. P. Fawcett.....	" 12 "	Geo. B. Pollard.....	" 14 "
Joseph McCullough	" 8 "	J. C. Mulrine.....	" 21 "
J. D. Paul.....	" 8 "	John H. Stewart....	" 24 "
G. W. Hukill.....	" 15 "	Benj. A. Frazer.....	" 12 "
I. B. Witters.....	" 15 "	W. H. Harrison.....	" 16 "
E. H. Chapman.....	" 22 "	A. H. Smith.....	" 15 "
A. Magee.....	" 6 "	D. Dunseath.....	" 28 "
James Dickery.....	" 6 "	Aaron M. Jordan....	" 28 "
G. H. Clark.....	" 28 "	Joseph H. Williams	" 31 "

William A. Gregg...A Pilot 19 years.	J. P. Schoonover.....A Pilot 8 years.
Ben. F. Hall..... " 18 "	Samuel I. Spence..... " 13 "
A. S. Crane..... " 20 "	Thomas J. Bruce..... " 28 "
Henry Pudder..... " 13 "	James A. Frazier..... " 20 "
John M. Snyder..... " 12 "	Wm. F. Fuller..... " 10 "
John Ferguson..... " 37 "	William Metcalf..... " 12 "
Jacob Remlein..... " 30 "	Andy S. Frazier..... " 25 "
W. F. Randolph..... " 18 "	James S. Frazier..... " 1 "
R. M. Henderson..... " 8 "	Moses Kirkpatrick... " 13 "

PROCEEDINGS

*Of the Cincinnati Board of Underwriters on the Cincinnati
and Newport Bridge Question.*

CINCINNATI, April 18, 1868.

To the Cincinnati Board of Underwriters:

GENTLEMEN: — As the question of bridging the Ohio river, between Cincinnati and Newport, Ky., is attracting much attention on the part of our citizens, we address you for the purpose of learning from your Board if a bridge at the point named, built upon piers three hundred (300) feet apart, will, in your judgment, create such an obstruction in the river, as to require the Insurance Companies to charge increased rates for insurance on the hulls of vessels, and property carried on them; and if so, what increased length of span should be adopted for bridging the Ohio river, both here and elsewhere, so as to leave the river reasonably safe for the purposes of navigation.

Respectfully,

ROBERT HOSEA & SONS.
TRABER & AUBERY.
BABBITT, HARKNESS & CO.
R. M. BISHOP & CO.
M. GREENWOOD.
DAVID GIBSON & CO.
WM. GLENN & SONS.
WM. RESOR & CO.

AND OTHERS.

CINCINNATI, April 20, 1868.

Messrs. Robert Hosea & Son, Traber & Aubery, Babbitt, Harkness & Co., M. Greenwood, David Gibson & Co., Wm. Glenn & Sons, R. M. Bishop & Co., Wm. Resor & Co., and others:

GENTLEMEN: — In reply to your letter of April 18, asking the opinion of the Board of Underwriters of this city, if the construction of a Pier Bridge across the Ohio, with three hundred feet space between the piers, would so obstruct the navigation as to require an advance rate of premium on boats and their cargoes plying between Cincinnati and Pittsburgh, — at a meeting of the Board, held at their rooms April 20, 1868, the following Resolutions were

unanimously adopted by the Board, and are herewith enclosed as an answer to your communication:

"Resolved, That it is the deliberate and settled opinion of the Cincinnati Board of Underwriters, that a bridge built across the Ohio river, between the cities of Cincinnati and Newport, Ky., with piers in the river three hundred feet apart, would prove a serious and dangerous obstruction to the navigation of the river; and that all Underwriters, in justice to their stockholders, will be obliged to charge increased rates for the insurance of property passing these piers.

"Resolved, That it is the judgment of the members of this Board, that where bridges are built over the Ohio river, that, in order to leave the navigation of the river reasonably safe, there should be a main span over the channel not less than five hundred feet long."

Respectfully yours,

JNO. BURGOYNE, *President pro tem.*

JNO. J. HOOKER, *Secretary.*

We concur in the foregoing action of the Board of Underwriters.

LOCAL INSURANCE COMPANIES.

WESTERN INSURANCE COMPANY.....	T. F. Eckert, President.
ENTERPRISE " "	Thos. Sherlock, "
NATIONAL " "	John Burgoyne, "
QUEEN CITY " "	Geo. W. Ncare, "
CRESCENT " "	J. W. Batchelor, "
MIAMI VALLEY INSURANCE COMPANY.....	Jos. S. Ross, "
PEOPLE'S " "	J. B. Lawder, "
BURNET " "	Jno. S. Taylor, jr., Secretary.
HAMILTON COUNTY " "	Col. J. Kennett, President.
MERCHANTS' AND MANUF'S' INS. Co.,.....	B. B. Whiteman, "
ECLIPSE INSURANCE COMPANY.....	J. J. Livingston, "
FARMERS' AND MECHANICS' INSURANCE Co.	C. J. W. Smith, "
CINCINNATI INSURANCE COMPANY.....	G. W. Williams, "
MERCHANTS' " "	J. C. Thomas, "
OHIO VALLEY " "	J. A. Devou, "
LAFAYETTE " "	Howard Mathews, "
MAGNOLIA " "	C. H. Marshal, Secretary.
COMMERCIAL " "	J. A. Townley, "
CITIZENS' " "	Th. G. Odiorne, President.
CENTRAL " "	Francis Ferry, "
EUREKA " "	Dan. Collier, "
BOATMEN'S " "	B. F. Davidson, "

GLOBE INSURANCE COMPANY.....	T. Dean, President.
FRANKLIN " " 	C. E. Demarest, Secretary.
FARMERS' " " 	M. Hollinghead, "
AMERICAN " " 	L. Clason, "
UNION " " 	A. C. Edwards, "
ADAMS " " 	John N. Newton, "
TOBACCO " " 	Sam'l L. Yourtee, "
EAGLE " " 	Sam'l P. Post, "
GERMANIA " " 	J. H. Carter, President.
FIREMEN'S " " 	H. E. Spencer, "
WASHINGTON " " 	Wm. Goodman, "
BUCKEYE STATE INS. Co.,.....	W. P. Hulbert, "
ÆTNA INSURANCE COMPANY, of Hartford...	J. B. Bennett, Manager.
PHENIX INSURANCE Co., of Hartford.....	H. M. Magill, Gen'l Agent.
WM. B. FRENCH & Co.	
CHAS. BONSALE & SONS, Delaware M. S. Ins. Co.	
OWEN OWENS, State Insurance Co., of Cleveland.	
WM. E. BROWN & Co.	
JOHN S. LAW.	
JOHN H. LAW.	
JACOB BURNET, JR.	
OLIVER PALMER, Marine Agent Underwriters..	

STATEMENT OF LEADING MERCHANTS.

As charges have been made, that the opposition to short-span bridges came from parties whose interests were opposed to such bridges, and were therefore based upon selfish considerations, the following statement, signed by a large number of leading merchants, manufacturers, and bankers, of Cincinnati, is submitted as evidence of the untruthfulness of such statements :

CINCINNATI, April 18, 1868.

It having been charged, that the opposition to the projected Newport and Cincinnati Bridge, with a span of three hundred feet, has "been started, manœuvred, and kept in motion" by "large owners in the Newport and Cincinnati Ferry, the Covington and Cincinnati Bridge, and the Mail Line of Steamboats," the undersigned feel it to be their duty to state, that while they stand in opposition to a bridge at this city of less span than five hundred feet, believing that such span is entirely practicable, and safe, and that responsible parties are ready to build the said bridge with such span, that they have not been influenced in this opinion by any stockholder of any of the organizations named above; but that their ground of objection is based entirely upon the fact that a bridge with piers only three hundred feet apart will prove a very serious obstruction to the safe navigation of the river, thereby inflicting great damage to the mercantile and manufacturing interests of our city. The *decisive and unanimous* action of the Chamber of Commerce, after a full and free discussion of the whole subject, participated in by both sides, we regard as a fair expression of opinion on this subject.

We also beg leave to state, that we are not owners, or in any way interested, in the Newport Ferry Company, the Covington Bridge Company, or the Mail Line Steamboats.

John Shillito.

Tweed & Andrews.

Mitchell & Rammelsberg Furniture
Co., by Robert Mitchell.

Drown, Douglass & Co.

Wm. Glenn & Sons.

Jos. S. Cleneay & Co.

Addy, Hull & Co.

Wm. Cleneay & Sons.

White, Brother & Co.

James A. Frazer & Co.

Wells, Jones & Co.

Silas F. Miller.

Wilshire, Huston & Co.

Wilshire & Co.

R. Macready & Co.

Babbitt, Harkness & Co

Meador & Co.

Proctor & Gamble.

Gibson, Early & Co.

Bare, Shinkle & Howell.
 S. H. Burton & Co.
 Evans, Clifton & Co.
 G. W. Ball & Co.
 Hobbs & Parker.
 Wilson & Hayden.
 Wm. Resor & Co.
 Robt. Hosea & Sons.
 Jas. S. Burdsall & Co.
 Means, Kyle & Co.
 Cin., Big Sandy & Pomeroy Packet
 Co., by T. N. Johnson, Sec'y.
 A. O. Tylor.
 John D. Minor & Co.
 L. H. Sargent.
 Charles Bodmann.
 C. & C. Mendenhall.
 Redway & Burton.
 David Gibson & Co.
 Straight, Deming & Co.
 Augustus Wessel.
 Rowland & Co.
 James Bradford & Co.
 R. Hemingray & Co.
 N. M. Florer.
 A. M. Bryson.
 Stearns & Foster.
 D. H. Mears.
 J. T. Warren & Co.
 James H. Laws & Co.
 G. W. Williams.
 T. Neave & Sons.
 Wm. Hooper.
 Titus & Sterrett.
 D. H. Hunnewell.
 D. A. James.
 Horne, Semple & Co.
 Robert Moore & Co.
 Joseph Kinsey.
 R. M. Bishop & Co.
 M. Werk & Co.
 N. Patterson & Co.
 Ohio River Salt Co.
 Geo. D. Winchell, Upson & Co.
 Royer Wheel Co.
 Buckingham & Mathers.

R. B. Smith & Co.
 Oliver Perin.
 Evans, Lippincott & Cunningham.
 Traber & Aubery.
 Lawrence Iron Works, by R. S. Be-
 son.
 John Bailie & Co.
 P. Moulton.
 Dubois & Augur.
 H. Grotenkemper & Co.
 G. Y. Roots.
 J. C. Thomas.
 Geo. Taylor.
 Richard Smith.
 Geo. W. Neare.
 Thos. Emery's Sons.
 Wm. Fletcher.
 Francis Ferry.
 J. F. Cunningham & Co.
 Benneville & Kline.
 C. J. W. Smith.
 W. H. Gilpin.
 Geo. W. Phillips, Jr.
 A. G. Gano.
 Kennedy, Eekert & Co.
 J. Walker & Co.
 A. M. Thornton.
 L. A. Logan.
 M. C. Vanpelt.
 Louis Jacob & Co.
 Frank Dryer.
 John Gould.
 John E. Stone.
 Wm. Williamson.
 Jas. R. Johnston.
 R. A. Holden.
 G. W. C. Johnston.
 J. H. Riec.
 Philip Hinkle.
 A. Buchanan.
 Geo. F. Davis & Co.
 James Morrison & Co.
 J. A. Ogborn.
 Sam'l Davis, Jr., & Co.
 J. V. Carnahan & Co.
 T. F. Eekert.

Geo. Shillito.
 Metcalf & Evans.
 M. Bailey.
 S. C. Newton.
 A. Judson Davis.
 H. D. Rodgers.
 Joseph Rawson.
 Jas. A. Devou.
 Wilson, Eggleston & Co.
 Geo. Bogen, Jr.
 Taylor & Brother.
 John S. Taylor.
 M. W. Stone.
 Marmet & Co.
 Hugh McBirney & Co.
 Flock & Fristor.
 Jacob Burnet, Jr.
 S. C. Gerard.
 J. F. Mills.
 O. Owens.
 H. W. Sage.
 Wm. Henry Davis.

Morrison & Rammelsberg.
 A. P. Cohen.
 Wm. W. Davis & Co.
 E. Smith & McAlpin.
 Wasson, Morgan & Co.
 S. G. Hubbard.
 Geo. Eustis.
 Geo. M. Hord & Co.
 J. H. Brunsman & Co.
 J. D. Balman & Co.
 J. L. Keck.
 Grove J. Penney & Co.
 Jos. P. Whittaker.
 C. E. Anderson.
 Lewis Worthington.
 A. E. Chamberlain.
 Thomas Phillips.
 Jac. Traber.
 Chas. Woodward, Jr.
 John Cochnower.
 Miles Greenwood.
 Neave, Ward & Co.

LONG-SPAN BRIDGES.

THE following paper, signed by forty-seven members of the Ohio House of Representatives, nearly all of whom voted for the short-span bill when it passed the General Assembly, is herewith submitted as an evidence of the change of opinion upon the part of these members, after seeing and hearing the testimony presented against short-span bridges. It is proper to state that this paper was not presented to Senators for their signature :

To the Honorable Members of the Senate and House of Representatives of the United States, in Congress assembled :

The undersigned, members of the General Assembly of the State of Ohio, deeply impressed with the incalculable importance to the people of this State, as well as to the people of the entire Ohio and Mississippi Valleys, of a free and unobstructed navigation of the Ohio River, and from careful examination being fully satisfied that such navigation will be seriously and dangerously obstructed by the erection of bridges across said river having a less span across the main channel than five hundred feet, and that such length of span may be built in a manner perfectly safe for all purposes of travel, do most earnestly pray that such legislation may be had by Congress as shall prevent the construction of bridges hereafter across said river having a less span across the main channel thereof than five hundred feet.

J. B. Cockerill, Adams County.
Francis B. Pond, Morgan County.
Samuel C. Kerr, Jefferson County.
W. T. Acker, Hocking County.
John W. Kennon, Belmont County.
Thomas M. Nichol, Belmont County.
Levi Dungan, Jackson County.
William Ritezel, Trumbull County.
S. F. Kerr, Fayette County.
William Shaw, Clermont County.
James Parks, Sandusky County.
John Lawson, Gallia County.
W. D. Hill, Defiance County.
Wm. Henry Scott, Hamilton County.
S. M. Richardson, Washington Co.

I. C. Pennisten, Pike County.
James Sayler, Preble County.
B. L. Hill, Erie County.
George W. Brooke, Mahoning Co.
N. B. Sherwin, Cuyahoga County.
I. J. Finley, Ross County.
L. McMarrell, Holmes County.
E. M. Fitch, Brown County.
Isaac Cusac, Hancock County.
Eliel Headley, Monroe County.
U. C. Rutter, Fairfield County.
Ralph Leete, Lawrence County.
J. C. Ullery, Miami County.
A. J. Swaim, Vinton County.
Wm. Larwill, jr., Ashland County.

James W. Newman, Scioto County.
C. Hughes, Butler County.
E. G. Denman, Williams County.
Chas. Hare, Noble County.
M. E. Gallup, Cuyahoga County.
William Sisler, Summit County.
Ross W. Anderson, Guernsey County.
Henry Wanking, Hamilton County.
Thoms Rough, Hardin County.

J. Mason Dunn, Morrow County.
M. C. Lawrence, Union County.
Geo. W. Skaats, Hamilton County.
H. G. Kennett, Hamilton County.
Peyton Hord, Marion County.
Joseph Dilworth, Stark County.
George Henricks, Perry County.
George Crist, Hamilton County.

ACTION

OF

STEAMBOAT OWNERS AND MASTERS.

At a large meeting of owners and masters of steamboats, held at the rooms of the Cincinnati Charitable Marine Association, on the 7th day of March, 1868, the following report was submitted by the committee, and unanimously adopted:

REPORT OF COMMITTEE.

To the President and Members of the Cincinnati Charitable Marine Association:

GENTLEMEN:—Your committee to whom was referred the matter of inquiring into the character of the bridge which it is proposed to build across the Ohio River between Cincinnati and Newport, together with the effect which such a structure would have upon the navigation of the river, the cost of insurance, and the use by steamers of the Public Landing, beg leave to submit their report.

We have not been able definitely to ascertain the exact character of bridge which the company propose to build. The bill now before the Ohio Legislature, and also before Congress, does not define specially the kind of bridge to be built. Enough, however, has been learned to warrant your committee in the statement that the bridge is to be built upon piers placed in the river, with a draw for the passage of steamboats, and that it is to be used for the passage of railroad trains as well as for other travel.

Your committee feel that they cannot too severely condemn a bridge of this kind, knowing, as they do, that it will be the means of causing annually great loss of property, and in many instances loss of life. The history of pier bridges on the navigable rivers of the West is too well known to navigators and those interested in the navigation of the rivers to need much comment at our hands. A reference to the Rock Island and Steubenville bridges is sufficient to draw attention to this class of structures.

Each of these bridges causes a loss of property, annually, equal to the interest on the cost of a structure which would span the whole river, and leave it safe both to life and property. This being the case, we ask why it is that Congress and our State Legislature will permit a stream like the Ohio river, floating its millions of tons of commerce, in merchandise, iron, coal, lumber, &c.,

enriching every city and town upon its shores, to be dammed up and obstructed by piers? The Niagara bridge and the bridge between Covington and Cincinnati have clearly demonstrated the fact that our navigable rivers can be crossed by bridges on the suspension plan, without obstructing the channel of the river, or in any way rendering its navigation unsafe.

If, then, the crossing of the Ohio River by bridges is narrowed down to a mere question of cost, we insist upon it that those who want them shall pay the cost of bridges which will leave the navigation free and uninterrupted. We admit that even suspension bridges will sometimes cause inconvenience to boats, in requiring that their chimneys shall be lowered to pass under them; but they do not cause danger to life, and destruction to property. As owners and masters of steamboats, taking a selfish view only, we would prefer that there should be no bridges crossing the navigable rivers.

But in this advanced age we are not permitted to hold to a purely selfish view upon this subject. We recognize the fact that the commerce of this great country requires that the rivers shall be bridged, and when this is properly done we should withhold all objection. The commerce of the country equally requires that the rivers shall be left free and safe for navigation.

A pier bridge at this city, in our narrow river, where there is such a constant passing and repassing of boats—where immense tows of coal and rafts of lumber are handled at almost all seasons of the year, would unquestionably be the cause, not merely of increased cost and danger, but of large actual loss of property.

Those insuring boats of every description would undoubtedly have to pay larger rates, and those who from choice and necessity were their own insurers would be subject to greater risk. It will hardly be denied that it is a natural law in underwriting that increased charges must be made to cover increased risks, and it is also undeniable, that piers placed in the river here or elsewhere create a danger and risk which before did not exist.

It is also the opinion of your committee, that in case this bridge is built, the daily packet boats now running between this city and the up-river ports, will have to abandon the use of the Public Landing, and find a landing above the bridge somewhere. They will hardly take the risk of running the gauntlet of these bridge-piers, endangering the lives of their passengers and the safety of their vessels and cargoes.

JOHN C. RENO,
DAVID GIBSON,
D. COLLIER,
JOHN KYLE,
JAS. H. PEPPER.

Subsequently, on the 3d day of April, 1868, the steamboat owners and masters at a meeting held at the same place, unanimously adopted the following resolutions:

Resolved, That while the steamboat owners and masters of Cincinnati adhere to the statements and facts set forth in the report of the committee ap-

pointed by the C. C. M. Association, and adopted by that body on the 7th day of March, touching the projected bridge across the Ohio river, between Cincinnati and Newport, and believe that all bridges across the Ohio river, above the Falls, should span the whole river, where it is not more than twelve hundred feet wide; yet, in order that they may not seem to stand in factious opposition to any improvement in the interest of Cincinnati, they now, by this resolution, agree that if the incorporators and stockholders of the said bridge will agree to construct the bridge as high above low water as the present Covington suspension bridge, and with a span of not less than 500 feet over the channel, that they will make no opposition to it.

Resolved, That we are unalterably opposed to the construction of draw-bridges on the navigable rivers of the West; and to all bridges on the Ohio which shall be less than one hundred feet above low water mark, and of less span over the channel at the river than five hundred feet, believing that such bridges, if built, will inflict incalculable damage to the commerce of the rivers, and to the cities and towns on their borders.

LETTERS

OF

DISTINGUISHED CIVIL ENGINEERS.

OFFICE OF JOHN A. ROEBLING, }
TRENTON, N. J., March 13, 1868. }

THEO. COOK, Esq., *Cincinnati*:

DEAR SIR: — You desire me to give an opinion on the subject of *bridging* our large Western rivers for railroad or common traffic. This subject appears to be but little understood, even by those who are most interested in navigation, and since legislation is but an expression of public opinion, it must be wrong and imperfect so long as public opinion is erroneous on this subject. Parties who were watching the interests of navigation heretofore, kept only one point in view; viz., sufficient elevation for the free passage of high smoke stacks. They always objected to draws, but they were willing to accept narrow spans, not as a matter of choice, but rather of necessity.

The widest draws are, at best, intolerable nuisances, and should never be permitted where it is at all possible to avoid them. Where there is a heavy traffic over the bridge and also on the river both interests will suffer from draws. While the draw is open nothing can pass over the bridge, and *vice versa*. But the greatest objection to draws is the danger to navigation. Witness, for instance, the draw in the Rock Island bridge, over the Mississippi river, which has been a great nuisance ever since this bridge was built. The large pivot pier which supports the draw offers a serious obstruction to the current, which, in high water, is so much and so powerfully deflected that it is almost impossible for steamers to steer clear of danger. Every draw in the country demonstrates its own nuisance, more or less.

It is evident that there must be a compromise between the interests of free navigation and those of land traffic, but it appears to me that from this compromise draws should be excluded by *common* consent, because they are equally dangerous and objectionable to navigation, as well as to the bridge travel.

Railroad men may insist upon draws as a necessity on our Western rivers; but in order to pass trains over a high bridge and steep grades all that is wanted is a stationary engine and a wire rope, to assist the train over the rise. In other words treat the bridge like an inclined plane and draws will be unnecessary.

The general question, how wide or narrow the spans of bridges should be on our Western rivers, is so important and involves so many issues that it is de-

deserving of a most thorough consideration. Are we not in danger for the want of a proper understanding of this subject, and, consequently, for want of proper and comprehensive legislation, to inflict the most serious injury upon the future navigation of these great national highways?

We owe it to our posterity to anticipate the future wants of commerce; at any rate, we have no right to wilfully or ignorantly obstruct it. During the next century the population of this country will have reached three hundred millions, and who can estimate the vast internal commerce which will then be carried on through the channels of our great Western rivers? The development of the coal trade alone will very soon justify the expenditure of sufficient capital to slack-water the Ohio River from Pittsburg to Louisville, for the purpose of obtaining a sufficient depth of water throughout the year. This trade alone will, during the next century, expand to one hundred millions of tons annually, and how is this vast mineral wealth to be transported? Certainly not in the old-fashioned flat-boat, but in well-built barges, as is already done, and towed up or down by powerful steam tugs. Not only coal, but all kinds of produce and merchandise will be carried in this manner, and at such rates that no railroad can compete with it.

The same practice of navigation which prevails on the Hudson River now will, after a while, be introduced on our Western rivers—large tows, acres in extent, will be towed down. This mode of navigation will become general, because cheap freights are a necessity everywhere. And now let me ask the question, Will the future river interests put up quietly with the nuisance of draw-bridges and narrow spans? When the Ohio River shall be crossed by hundreds of bridges, and when the floating tonnage will be estimated by the hundred millions, shall this vast interest be forever subjected to the obstructions created by numerous piers, spans and draws?

On a former occasion I have expressed the opinion that no bridge should be allowed to be constructed over our Western rivers with spans of less than five hundred feet in the clear. Bridge builders and engineers, generally, will object—that such spans are impracticable for railroad traffic; but the Niagara bridge has forever settled this question, and its span is over eight hundred feet. Such bridges are no longer questions of impracticability, but simply questions of cost.

On the Lower Ohio, and on the Mississippi and Missouri Rivers another important issue is involved in this question, and that is, the safety of foundations. The bottoms and banks of those rivers are composed of alluvial material and fine floating sand. By the action of high floods, the channels are constantly being changed, and the river bed is scoured out in places to a great depth, sometimes fifty to sixty feet. Now, if the river is obstructed by numerous piers, and divided into narrow spans, through which the water is forced, you will readily perceive how much the scouring action of the floods will thereby be increased. No bridge with narrow spans is safe in these rivers without rock foundations. The Rock Island bridge and Clinton bridge, over the Mississippi, are located where the river bed is hard and rocky; but at many other points no rock will be found at a less depth than fifty to one hundred feet.

But such deep foundations are very expensive; and it will be found more economical to decrease the number of piers, and increase the length of spans, than *vice versa*.

I will close this long communication by repeating, that a general act should be passed by Congress, for our Western rivers, forbidding the use of draws, fixing the minimum of clear span at five hundred feet, with an elevation, in the center of the river, of no less than forty feet above high water.

Respectfully and truly, yours,

JOHN A. ROEBLING.

OFFICE OF JOHN A. ROEBLING, }
TRENTON, N. J., April 7, 1868. }

THEODORE COOK, Esq. :

MY DEAR SIR:—In your note of the 4th, you request me to state some of the facts relating to the practicability of large span railroad bridges. The following railway bridges, all on leading lines and doing a heavy business, are constructed on different plans, and have all stood the test of time :

The Niagara bridge, in this country, with one clear span of 820 feet.

The Steubenville bridge, over the Ohio, 320.

The Britannia bridge, in England, spans of 460 feet.

The Saltash bridge, over the Tamer, England, spans of 455 feet.

The Rhine bridge, at Cuilinburg, in Holland, spans of 500 feet.

The Dirshau bridge, over the Weichsel, in Prussia, 390 feet.

The Hogat bridge, in Prussia, 320 feet.

The Rhine bridge, at Cologne, Prussia, 320 feet.

The Rhine bridge, at Coblenz, Prussia, 320 feet.

The Rhine bridge, at Mayence, Prussia, 332 feet.

I might extend this list, but if this number is not sufficient to establish "practicability," no number and no argument will. When I recommended 500 feet spans, I was fully aware that bridge builders and railroad men generally would object, because the erection of large spans certainly involves a little more cost and also a little more skill. But by combining the suspension principle with the truss, as I have often recommended, a considerable saving will be effected. Spans of 500 feet, on this plan, will not cost more than ordinary lattice or truss plans of 350 feet.

For the Cincinnati and Newport bridge I would recommend a trussed suspension bridge, with a middle span of 700 to 800 feet, and two half spans of 350 to 400 feet, as the best, and also the cheapest in the end. The various stories circulated about the Niagara bridge are all nonsense. That bridge will admit of the highest practicable speed for passing trains, but it would be madness to permit it over that fearful chasm.

Truly yours,

JOHN A. ROEBLING.

OFFICE OF ST. LOUIS AND ILLINOIS BRIDGE CO., }
 ST. LOUIS, April 7th, 1868. }

MR. THEODORE COOK :

DEAR SIR: — In reply to your letter, I beg to say that no published official report of this bridge has yet been made. I am at present engaged in the preparation of one, and as the Company expect to ask our citizens to make a loan of the city's credit, to the extent of \$4,000,000, in aid of the enterprise at the next election, the report will be an elaborate one. It will not, however, be published for nearly a month, as it will contain several diagrams and illustrations, now in the hands of the engravers. I am glad to see the friends of river navigation moving so earnestly to prevent the obstruction of our great marine highways. After the able letter of Mr. Roebling, recently published in one of our city papers, and which you have doubtless seen, I feel that I can say nothing to add to its force.

By the principle of arch, either suspended or upright, we are enabled to construct much longer spans without increasing the cost of the structure, than is possible by any of the methods of trusses yet devised. Being placed in possession of the calculations made for the truss bridge at this city (by the consolidation of the two companies), I am able to prove that the bridge I am constructing with three spans of about 500 feet each, can be more cheaply built than the truss bridge designed for the rival company, with two spans of but 364 feet (or a clear water-way to each of 350 feet), and the remaining spans of 240 feet.

The greater strength of cast steel makes it cost considerably less than that of iron in long spans; and as its compressive strength is greatly in excess of its tensile strength, it seems peculiarly fitted for the construction of upright arches. There is nothing to prevent the spanning of your river at Cincinnati with arches of 1,000 feet with entire safety, and at a cost not greatly in excess of 350 feet trusses. In every form of trusses there must be an upper and lower chord, one for compression and one for tension. The arch alone, of all forms of bridging, requires but one of these members. The suspended arch requires the tension member only, and the upright arch the compression one. The anchors of the compression bridge supply the place of the upper, or compression member of the Fink truss, by preventing the points of support from being pulled together, the strain at the points of support (or towers) being transferred directly to the anchors. In the upright arch, the abutments supply the place of the tension chord in the bow-string girder. The same principle pervades every form of truss known, and as there is no great difference in the weight or cost of one or the other of these members, if one or the other be dispensed with, we have at least the cost of it to invest in masonry before we incur any additional expense by substituting the arch. As, however, the cost of the truss rapidly augments as the span is increased, while the arch does not, in the same ratio, we are enabled to construct large spans in that form with much greater economy.

In the short limits of a letter like this, I cannot explain why the arch is so

much more economical, except in the brief manner above stated; nor would it, perhaps, be becoming in me to attempt to do so here. When my report is published, I shall be happy to send you a copy.

Very truly, &c.

JAS. B. EADS,

Civil Engineer.

PITTSBURGH, PENN., May 23, 1868.

To THEO. COOK, Esq.,

Chairman of Committee Chamber of Commerce, of Cincinnati:

DEAR SIR:—Your letter of the 22d has been received, and I hasten to answer it in a general way; not being prepared to enter upon so important a subject in a professional manner, and in detail. As an engineer, I have planned and built some important bridges—one over the Susquehanna river, at Harrisburg, over four thousand feet in length; but I have not professionally superintended any bridges having spans so great as five hundred feet.

I was familiar with the old wooden bridge at Fairmount, Philadelphia, of three hundred and forty feet span, and afterward with the present suspension bridge, erected in its place, three hundred and fifty feet, constructed by CHARLES ELLETT, JR., Esq., aided by JNO. A. ROEBLING, Esq.; afterwards with suspension aqueduct and two suspension bridges, erected by JOHN A. ROEBLING, Esq., at Pittsburgh; also with the suspension bridge at Wheeling, 1,020 feet span, erected by CHARLES ELLETT, JR., Esq.

When Mr. ROEBLING, was planning his great Rail Road bridge over the Niagara, he asked my opinion respecting the engineering merit of his proposed plan for stiffening a span of eight hundred feet, as designed, for heavy railroad traffic. My opinion was, and I so said, that it would do for moderate rates of speed. He remarked, that railroad engineers generally, both in this country and in Europe, had predicted that it would be a failure. I thought otherwise. He built the bridge; and after it had been some time in operation, I took occasion to examine the working of it, and was much gratified to find that it was stiffer than I had anticipated, and answers well, not only for railroad traffic of the heaviest kind, but common road travel besides.

It was a bold piece of engineering on the part of Mr. ROEBLING; and, in my opinion, he deserves the lasting commendations of every American engineer, and indeed of every engineer in the world, for its conception and its complete triumph. It has been in constant use many years, and I have been assured by those who know, that it has not failed, but subserves its double purpose of accommodating railroad and common road traffic admirably.

Bridges on a similar general plan, of not more than five hundred feet span (or three hundred feet less than the Niagara bridge), can, in my opinion, be constructed over the Ohio river, that will answer perfectly well for railroad and other traffic.

I have no doubt that bridges of five hundred feet span, adapted to railroad

and other uses, can be constructed without using the suspension principle; but they would be much more costly, and I am not at present prepared to enter upon the consideration of such plans beyond this general opinion.

With the experience before me, I cannot hesitate, as an engineer, to express the opinion that bridges of five hundred feet span, for railroad and other purposes, can be constructed across the Ohio river. And, from my experience on this particular river, I think that the interests of the country demand that every bridge hereafter to be constructed over this important stream should be required to have one span of not less than five hundred feet over the main channel.

Very respectfully,

Your Obedient Servant,

W. MILNOR ROBERTS,

Civil Engineer.

THE CINCINNATI BRIDGE COMPANY

AND

THE ST. LOUIS CONVENTION OF ENGINEERS.

THE following, from the St. Louis (Mo.) Democrat of May 22d, containing extracts from the report of Mr. JAMES B. EADS, Chief Engineer of the splendid bridge now in course of construction at St. Louis, is submitted, as a fitting reply to a pamphlet circulated at Columbus, Ohio, and perhaps at Washington, entitled, "Facts relating to the Bridge Question." Mr. EADS' report in full will soon appear, and is respectfully commended to the attention of Congress.

A lively controversy is just now going on between the new Bridge company, at Cincinnati, and those who are opposed to the obstruction of the Ohio by bridges of less than five hundred feet span. The Bridge company have issued a pamphlet, a copy of which is before us, entitled "*Facts Relating to the Bridge Question*," the object of which is to prove that five hundred feet spans are unsafe. In endeavoring to establish this fact, several extracts are published from the report of the Convention of Engineers, called here last August, by Mr. Boomer, of Chicago. We stated to our readers at the time, that the sole purpose of the convention was to defeat, if possible, the erection of the St. Louis Bridge Company's bridge, designed by Mr. James B. Eads. As the pamphlet in question is calculated to extend and increase the false impression created at that time regarding the safety and economy of the bridge now building here, we have taken the liberty of publishing the subjoined extract from the official report of Mr. Eads, engineer in chief of the work. We commend it to the careful perusal of the public in general, and especially to those interested in the controversy at Cincinnati. The report is now in press in our job office, and will soon be ready for distribution. The dignified courtesy and charity with which he endeavors to shield a body of his professional brethren from the charge of permitting themselves to be used for a discreditable purpose, which some unworthy member, in preparing their report, has evidently made them liable to, and where Mr. Eads was to have been the injured party, does not in any degree lessen the irresistible proofs which he gives of the safety and practicability of five hundred feet spans, or of the incorrect statement made in the report of the convention, that there was no engineering precedent for such spans.

CONVENTION OF ENGINEERS.

The organization of two companies about the same time for the purpose of bridging the river at St. Louis, and the rivalry existing between them for nearly twelve months prior to their consolidation under the present organization, was the cause of many difficulties thrown in the way of the construction of your bridge. One of these companies, generally known as the Boomer company, called together a convention of engineers last August to consider the question of bridging the Mississippi river at this point. Although composed in part of many distinguished and able engineers, it was known to have been held solely in the interests of that company. The plans designed for that company by Mr. S. S. Post, C. E., were laid before it and approved by the convention. The plans designed for your bridge, and adopted by you, were not solicited by the convention for its examination, and at no time were those plans under consideration by it. At no time did the convention take up the subject of bridging the river by *arches*, but simply by *trusses*, and it therefore very properly recommend that no spans exceeding three hundred and fifty feet in the clear should be adopted.

Notwithstanding all these facts, it was industriously reported by your opponents that the plans adopted by your bridge had been condemned by that convention as unsafe, enormously extravagant and utterly impracticable; and that it had also condemned the location of it as very injudicious. It is because these statements are even yet repeated by parties interested in defeating the erection of the bridge, and because they are credited by many persons anxious for its completion, that I call your attention to them, and pronounce them one and all utterly untrue. One effect of these misrepresentations has been to create a belief in the minds of many that the plans adopted by you will involve a much greater outlay than is really necessary. This impression has been strengthened, no doubt, by the fact that those plans represent piers and abutments much more massive, and superstructure far more graceful and elegant than any form of truss bridge yet constructed. Yet one of the most beautiful and graceful structures in this or any other country, with its massive masonry and enormous span, is one of the cheapest ever erected. I refer to the suspended arch bridge of Roebling's at Niagara.

We are too prone to associate our contemplation of the beautiful in architecture and engineering with an idea of costliness, which is not always just. It is easy to prove, beyond the possibility of a question, that in no other form could the material in those members of your bridge which impart to it the chief feature of its gracefulness, be used with such economy.

It rarely occurs that any great enterprise is undertaken and completed without some opposition, no matter how praiseworthy the purpose or how many millions will be benefited by the work. If the private interests of some one or more individuals are affected by it, opposers, both open and secret, will be on the alert to assail it, and delay or defeat its consummation. It would be strange, indeed, if your undertaking met with nothing but encouragement, and proved an exception to a rule that is, unfortunately, almost invariable.

From its inception, you were opposed by a rival bridge company, whose antagonism was stimulated and encouraged by the active or passive co-operation of members of two wealthy monopolies, (the ferry and transfer companies) and by others, actuated by motives best known to themselves.

The consolidation of the two bridge companies has removed the rivalry between them, and every legal doubt as to your chartered privileges also; but the opposing influences of the ferry and transfer companies remain. It would have been wonderful if the plans of your bridge should have escaped, not only severe criticism, but unjust misrepresentation also, in a controversy that has prominently occupied the attention of the public for several months past, and elicited great warmth of feeling. In this controversy, the safety of the bridge has occasioned much discussion, and the most ridiculous assertions on this point were again and again repeated. Originating with those who have opposed the erection of the bridge, these objections have been adopted, in some instances, by men really anxious for your success, but who have not had the time, or felt sufficient personal interest in the matter to investigate it for themselves. Others again, occupying the position of wealthy citizens, have perhaps felt the necessity of some apology for not aiding an enterprise so commendable, and have willingly adopted these misrepresentations to excuse their own indifference. Instead of generously abstaining from placing obstacles in the path of an enterprise that should command the best wishes of every one, they have in this way aided its most determined opposers.

The effort to create a want of confidence in the safety of your bridge was supported, to a certain extent, by the fact that this convention declared in its report that there was no engineering precedent for a span of five hundred feet, and also by stating that "there has been no bridge of the character of that which (in our judgment) is required at this place yet constructed, to furnish us with any reliable and certain data on the serious questions of materials and workmanship in spans of such great length."

By reference to a copy of the official publication, in my office, made by the Dutch government in January, 1866, of the details and plans of the Kuilburg bridge over the Leek, an arm of the Rhine in Holland, you will see that its greatest opening is spanned by a truss of one hundred and fifty-seven metres, or five hundred and fifteen feet, in length, constructed on the method used in the bridge at Hartford, Connecticut. This bridge has a double-track railway through it, and this truss weighs nearly two thousand and four hundred tons, and is partly of steel.

In 1801 the great Scottish engineer, Thomas Telford, proposed to replace the old London Bridge with one of cast iron, having a single arch of *six hundred feet* span. His suspension bridge over the Menia Straits is one of the most substantial structures of the kind in the world, and spans five hundred and seventy feet. A cast iron arch bridge of a single span of five hundred feet was proposed by him in preference to the suspension one, but was rejected by the government, because the arch gave less room on each side of the channel for sailing vessels.

For forty years this remarkable man continued to enrich Scotland and England with some of the most stupendous and successful triumphs of engineering

skill to be found in Great Britain. The erection of more than one thousand and two hundred bridges by him, many of them cast iron, made his experience in bridge construction, superior to that of any man of his period. Many of those erected by him are among the largest and most substantial structures in that country.

A select committee was appointed by Parliament to examine his plans for the six hundred feet arch, and the opinions of the most eminent, practical, and scientific men of the British Empire were taken before it on the subject, among whom were James Watt, John Rennie, Professors Robinson and Playfair of Edinburgh, and Hutton of Woolwich. The plans were approved and adopted, and the work upon this stupendous arch was actually begun.

Although this great work was ultimately abandoned, it was from no want of confidence in the plan, but because (according to Stephenson) the highth of the arch (sixty-five feet) involved the necessity of raising the streets leading to it, by which too much valuable property would have been depreciated. In a private letter to a friend, Telford informs him that his plans were adopted for this bridge; he says: "If they will only provide the means, and give me elbow room, I see my way as clear as mending the auld brig at the burn."

Surely, the recorded judgment of such a man as Telford, when sustained by the most eminent men of his day, asserting the practicability of a *cast iron* arch of six hundred feet span in 1801, furnishes some "engineering precedent" to justify a span of one hundred feet less in 1867.

When we take into account that the limit of the elastic strength of cast iron in compression is only about eight thousand pounds to the square inch, and that in cast steel it is at least seven or eight times greater; and consider the advance that has been made in the knowledge of bridge-building since the days of Telford, it is safe to assert that the project of throwing a single arch of cast steel, *two thousand feet* in length, over the Mississippi, is less bold in design, and fully as practicable as his cast iron arch of six hundred feet span. Engineering precedents have nothing to do with the question of length of span in a bridge. It is a money question altogether. The problem to be solved is simply, what length of span will pay best? This being decided, and profit enough assured to justify the outlay, engineering skill and knowledge will be found fully equal to its accomplishment, no matter what may be the length required. That one made of a material eight times as strong as cast iron is unsafe or impracticable five hundred feet long—is almost too ridiculous to be noticed in a country where the assertion is rebuked by Wernwag's *wooden* arch of three hundred and forty feet, which spans the Schuylkill at Philadelphia.

It must be remembered that the report of the convention has the names of several able engineers appended to it who were not present at its meetings; that those who were present considered no method of construction except trusses; that its deliberations for the solution of the grave questions involved in bridging this river occupied scarcely a week; and that it was convened almost solely in the interest of Mr. Boomer, who then controlled one of the charters of your consolidated company, and the patent for the truss bridge he intended building. When these facts are considered in connection with each other, it will be understood why the plans for your bridge were not solicited

for comparison with Mr. Post's patent truss; and when you take the statement of Mr. Post himself, as chairman of the committee on superstructure, that to span a clear opening of five hundred feet with his truss, would cost as much as to span two openings of three hundred and fifty feet each, and one and a half of two hundred and fifty feet each, in addition; or that the superstructure of the bridge, if built on his plan, would cost \$750,000 more with one five hundred foot span than if two of three hundred and fifty feet were used, you will understand fully why the preference was given (on the score of economy) to spans of three hundred and fifty feet.

An investigation by the convention of the plans adopted by you, would have revealed the fact that the superstructure of your bridge, possessing greater strength than the one it endorses, and with its great openings, could be erected for about four hundred thousand dollars less than the truss bridge approved by them, with its greatest spans of but three hundred and fifty feet; and no part of this saving is absorbed by cost of foundations, as those approved by it, on account of the great quantity of iron required, are more expensive also than yours. The proof of these facts will be found in another part of this report, and they are set forth in a manner that admits of no refutation.

It is, however, not so easy to understand why a body so intelligent as this convention, should forget the authority of Telford and his eminent cotemporaries, and the five hundred feet truss bridge over the Leck at Kuilinburg, in Holland, and be led into the error of asserting that there was no "engineering precedent" for a span of five hundred feet. If it were expected to span this river with an exact copy of some bridge now standing elsewhere, the necessary data could be obtained and applied without convoking so much ability. Any respectable bridge building firm in the country has, no doubt, sufficient engineering talent constantly in its service for such an emergency, and could have had the requisite plans copied, and the structure erected, without calling a convention of such distinguished gentlemen to deliberate upon them. When no "engineering precedent" exists, however, and where data "on the serious questions of material and workmanship in spans of such great length" *are not* supplied by structures of equal magnitude, there *is* a necessity for bringing to the consideration of the subject the profoundest thought, based upon a thorough acquaintance with the strength of materials as experience and experiment alone can furnish, together with a knowledge, obtained by careful study and observation, of the laws which guide us in the combination of those materials.

For increasing the dimensions of a truss beyond any now existing, a knowledge of the strength of materials, and the laws that govern their application, was sufficient to enable the convention to deduce with entire safety, such data from the experience furnished by the four hundred and fifty foot truss of Brunel, over the Tamar, the 397 feet trusses of the Dirshau bridge, over the Weichsel, and a dozen others of lesser span, if the Kuilinburg truss were not in existence.

The wording of the report, inconsiderately, and I believe quite unjustly to the members of the convention, makes that body seem to condemn the adoption, not simply of a *truss* of five hundred feet, but a *span* of that length, whereas it really investigated no other methods of construction to determine

their relative economy with the truss. It simply compared the five hundred and the three hundred and fifty feet trusses with each other; and instead of being content to condemn the use of the long one on the score of economy alone, which would certainly have been sufficient, it thoughtlessly gives a reason for not using a five hundred feet span that is not only unsupported by truth, but which is also a discreditable one to a profession whose greatest merit lies in its ability to overcome difficulties by the application of physical laws, *without* the aid of precedents. By this negligent (or adroit) wording of the report, the professional reputation of the members is made to injure a kindred enterprise of whose existence they were not ignorant, by making each one of them appear to condemn the plans of a rival structure they had never seen. A thing which no one of them would do deliberately, if he valued his own reputation.

The biographer of Telford relates that a scheme for a broad ship canal was started to connect the Mersey, opposite Liverpool, with the estuary of the Dee, the object being to enable shipping to avoid the shoals and sand banks that obstruct the entrance to the Mersey. Telford entered on the project with great zeal, and his name was widely quoted in connection with it. It appeared, however, that one of its projectors, who had secured the right of pre-emption of the land on which the only possible entrance to the canal could be formed, suddenly sold out for a large sum to the corporation of Liverpool, who were opposed to the plan. His biographer says that "Telford, disgusted at being made the instrument of an apparent fraud upon the public, destroyed all the documents relating to the scheme, and never spoke of it afterward, except in terms of extreme indignation."

Considering that the convention was assembled solely in the interests of a rival company, and after the fact of your adopting five hundred feet spans had been published, the inference drawn from this part of the report is quite conclusive that the eminent reputation and distinguished standing of its members, have been used for a purpose quite similar to that related of Telford; and knowing that the same keen regard for rectitude displayed by that engineer, is shared in by almost every member of a profession based on laws incapable of deception, and the daily application of which, in the routine of their duties, naturally inculcates a love of all that is truthful and correct; I feel assured that they have cause to feel, and doubtless do feel, equally indignant with Telford.

If there were *no* engineering precedent for five hundred feet spans, can it be possible that our knowledge of the science of engineering is so limited as not to teach us whether such plans are safe and practicable? Must we admit that because a thing never has been done it never can be, when our knowledge and judgment assure us that it is entirely practicable? This shallow reasoning would have defeated the laying of the Atlantic cable, the spanning of the Menai Straits, the conversion of Harlem lake into a garden, and left the terrors of the Eddystone without their warning light. The Rhine and the sea would still be alternately claiming dominion over one-half of the territory of a powerful kingdom, if this miserable argument had been suffered to prevail against men who knew, without "an engineering precedent," that the river could be controlled, and a curb put upon the ocean itself.

RATES OF RIVER FREIGHTS.

CINCINNATI, June 1, 1868.

TO THE COMMITTEE OF CHAMBER OF COMMERCE:

GENTLEMEN: — In compliance with your request, we herewith furnish you the present rates of freights, *via* river transportation, from this city to the ports named.

TO NEW ORLEANS, LA....distance 1,590 miles	25 cents per 100 pounds.
TO MEMPHIS, TENN	" 790 " ...18 to 25 " "
TO ST. LOUIS, MO	" 750 " ...15 to 20 " "
TO CAIRO, ILL.....	" 550 "15 " "
TO LOUISVILLE, KY.....	" 150 "6 to 10 " "
TO PARKERSBURG, W. VA.	" 300 "8 to 10 " "
TO WHEELING, W. Va.....	" 400 " ...10 to 12½ " "
TO PITTSBURGH, PA.....	" 500 " ..12½ to 15 " "
TO NASHVILLE, TENN.....	" 690 " ...15 to 25 " "

The rates for towing iron ore from St. Louis to Cincinnati, distance 750 miles, is \$3.00 per ton, of 2,240 pounds; and from St. Louis to Pittsburgh, distance 1,250 miles, \$4.50 to \$5.00 per ton, of 2,240 pounds. Nearly all shipments of heavy manufactured articles from Pittsburgh to St. Louis, this year, have been carried at 15 cents to 20 cents per 100 pounds the whole distance of 1,250 miles.

ROSE & BATCHELOR,
Steamboat Agents, 21 Public Landing.

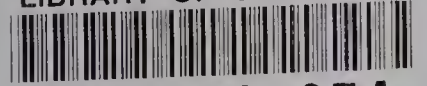
BRYSON & BENNET,
No. 18 Public Landing.

E. S. BUTLER & CO.,
No. 16 Public Landing.

W. S. GETTY,
No. 14 Public Landing.

ROBINSON & MOSSET,
No. 4 Main Street.

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